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## CIRAS News (Vol. 35, No. 2)

Iowa State University Center for Industrial Research and Service

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# CIRAS NEWS

Center for Industrial Research and Service

Volume 35, Number 2, Winter 2001



## CIRAS and industry partners help shape Iowa's energy future

By Reg Clause and Ron Cox, Ph.D.

"Iowa Industries of the Future" is a phrase that is resonating around CIRAS these days. What is Iowa's vision for industry in 2005? In 2020? What are the economic opportunities for a state that is intensive in energy usage but possesses so much energy production potential? How will industry, academia, and the federal labs team up so that Iowa industry achieves its vision?

The federal Industries of the Future (IOF) is a U.S. Department of Energy (USDOE) effort that was initiated to boost industrial efficiency and productivity. The focus is on lowering raw material and energy use per unit output, improving labor and capital productivity, and reducing wastes and pollutants. National teams of industry leaders were brought together to outline an approach to achieve improvements in nine energy and waste-intensive industries—agriculture, aluminum, chemicals, forest products, glass, mining, metalcasting, petroleum refining, and steel. Each team of visionaries generated both a vision document and a roadmap of how to achieve these goals by year 2020.

The successful federal IOF effort was logically extended to include state-level programs. This expands the innovative dynamic by tapping regional and business motivations to succeed and builds on the IOF visions and roadmaps. Last year the Iowa Department of Natural Resources and Iowa State University applied for and were awarded a USDOE grant and the Iowa IOF project commenced in early October 2000. CIRAS Industrial Specialist Ron Cox was instrumental in putting the proposal together and is now project manager of this new CIRAS effort. Cox is supported by staff from ISU's Value-Added Ag Group, University of Northern Iowa's Metal Casting Center, and the Iowa Energy Center.

Iowa will initially focus on two IOF-targeted industries: metalcasting and agriculture. The Iowa chemical industry may soon be the third target.

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# CENTER FOR INDUSTRIAL RESEARCH AND SERVICE

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## Tim On Constraints

by Tim Sullivan, CIRAS

**W**hat is TOC? Currently, there's a lot of confusion about the meaning of TOC, and where it fits in the operation of a successful enterprise. Is TOC a tool? A set of tools? A production solution? An overall management philosophy?

Like many other concepts, business professionals have gathered knowledge of TOC in various ways, but most commonly from reading Eli Goldratt's business novel, "The Goal." Readers enthusiastically apply in their own organizations what they have gleaned from the book, and many have produced incredible results. Most have done so, however, by applying only a limited portion of the TOC body of knowledge.

Personally, I try not to use the label "theory of constraints" even though that's what TOC stands for. The word "theory" is problematic. It has been my experience that most managers don't have the time to talk about theory — they want practical applications. The word "constraint" itself seems to confine many managers' thinking about TOC to the limited context of an operational/tactical tool that is used to manage bottlenecks. As a result, most managers have no idea that TOC, when fully understood and holistically deployed, can be a strategic weapon for their organization. In an effort to avoid these pitfalls, I simply use TOC like a proper noun, and then define the term more fully as the situation demands.

What if your company finds itself in a situation where production has the ability to meet demand, but the distribution network blocks the flow of products to the marketplace? In this case, I would talk about the "distribution solution" and how it has been used to increase order fulfillment rates while reducing finished goods inventory.

Product life cycles are shrinking, and for some companies the ability to bring new products to market faster is what blocks higher levels of success. If this were true for your company, I would talk about the "critical chain" project management method that has successfully shrunk lead times without reducing project scope or increasing budgets.

What about a company where chaos is all too common? One where marketing and sales—and not to mention engineering—don't seem to speak the same language? This is where TOC shines the brightest! I would tell you about an eight-part video series that features Goldratt himself discussing how production impacts distribution, how marketing impacts engineering, and how measurements impact everyone.

Obviously, there is much more that needs to be said in order to adequately define TOC, but the space here is insufficient for the task. To find out more, simply point your Internet browser to: <http://www.ciras.iastate.edu/toc/tocintroductionwww/index.htm>

This will bring up the "Introduction to TOC" slide show. After viewing the show, click on the "Home" button, and you will find a wealth of information provided in other links on the CIRAS TOC site. Tim Sullivan may be contacted at 515-727-0656 or [sullytt@ciras.iastate.edu](mailto:sullytt@ciras.iastate.edu).

**Enjoy the site, return often, and remember, your focus determines your reality!**



## EDE hosts two-day meeting with president of NTU

By Rebecca Sidler Kellogg, Director, Engineering Distance Education

In November, Iowa State University became one of the first institutions in the nation to host a visit by Dr. Andre Vacroux soon after he became president of the National Technological University (NTU). While on campus, Dr. Vacroux and his assistant, Dorle Clark, toured the Virtual Reality Applications Center (VRAC) and met with several faculty, CIRAS staff, and the College of Engineering administration to explore ways in which the university and CIRAS could expand their roles in NTU operations.

ISU has been a member institution of NTU since it was founded in 1984. Over the years, faculty have provided several credit courses in electrical and computer engineering to NTU students, resulting in ISU's increased visibility to a national audience. NTU has also provided ISU a means to offer courses to markets across the United States that it would traditionally not have accessed.

This spring semester, ISU will offer four courses through NTU. They are information warfare, cryptography, applied systems engineering, and finite element fundamentals applications—a new graduate-level course currently being offered at ISU to on-campus and off-campus students across the state. This course, with its emphasis on practical fundamentals of applying finite element analysis, is intended to have a strong industry focus. To this end, the instructor, Dr. Vinay Dayal from the aerospace engineering and engineering mechanics department at ISU is working closely with off-campus students to develop industry-focused topics and projects.

NTU students can select courses from fourteen different master's degree programs and can receive both NTU and ISU credits. Faculty at ISU are strongly encouraged to propose new courses to NTU for future offerings, thereby increasing the base of engineering education to reach a wider audience.

In addition to credit courses, NTU offers high-quality short courses conducted by internationally recognized experts who focus on leading-edge technology and trends. Recently, NTU joined with the PBS Business Channel, and using its advanced technical facilities has provided business and management programming to a broader audience.

The two-day NTU visit to campus resulted in several options that ISU is considering for expanding its partnership with NTU:

- Increase the number of ISU-produced credit courses made available through NTU.
- Expand into the undergraduate market by offering a proprietary B.S. degree in electrical engineering. ISU has offered a distance education B.S.E.E. program for several years, but offering it through NTU would gain ISU valuable national visibility.

- Offer a master's program in information security as another ISU-proprietary degree.
- Initiate master's degrees in systems engineering, mechanical engineering, and materials science and engineering.
- Establish a graduate certificate or degree course through the Center for Nondestructive Evaluation (NDE), which is currently in the process of creating distance education courses (both credit and non-credit).
- Offer short courses (from two-hour to multiple-day courses) through NTU, utilizing CIRAS and ISU expertise.
- Expand on ISU's tradition of offering undergraduate courses (as in electrical engineering) that function as bridging courses, which provide pre-requisite knowledge to NTU students. Bridging courses in other engineering disciplines are also being considered for NTU.

Not all of the above opportunities will be realized at once, but they are a strong indication of ISU's potential to enhance its workforce and visibility in an ever-expanding education network. More information about NTU can be found at [www.NTU.edu](http://www.NTU.edu) or by contacting

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email: [ede@iastate.edu](mailto:ede@iastate.edu).

## CEDAR FALLS SIGNATURE CENTER BECOMES NTU SITE

This fall, CIRAS purchased a four-channel digital satellite downlink system for receiving NTU professional development programming and credit courses. CIRAS can now tap into over 14,000 broadcast hours of credit and professional development programming annually from NTU. Similar capabilities exist in Howe Hall as part of EDE's distance learning operation. NTU broadcasts programs from over 50 member university campuses (including Iowa State University) across the country.

The Cedar Falls system can receive four simultaneous program feeds from a roof-mounted satellite antenna and distribute and/or record the programs via its built-in cable transmission system. Similar to a local cable facility, this system can also be used to play back video programming to potential subscribers within the center.

In November, Paul Jewell and Hiro Iino from EDE went to Cedar Falls to assist in the installation process. EDE will work with CIRAS staff member Mike Willett to establish short courses and courses for credit in technical and business/management for northeastern Iowa businesses through NTU. Look for programming announcements on the CIRAS Web site or contact Mike Willett 319-266-3260; email: [mwillett@ciras.iastate.edu](mailto:mwillett@ciras.iastate.edu) at the Cedar Falls CIRAS office.



## Best manufacturing practices stresses lean operations

By Helen K. Randall, HKR Communications

**O**ne avenue of assistance available from the Iowa Procurement Outreach Center (IPOC) is gaining fresh momentum lately. Best manufacturing practices (BMP) is a system of documenting, explaining, and sharing manufacturing practices that has proven successful among manufacturers across the country.

IPOC is one of only eleven BMP satellite centers in the U.S. The centers are sponsored by the U.S. Department of the Navy and the U.S. Department of Commerce, with its headquarters at the University of Maryland.

"These centers promote best manufacturing practices that have been documented around the country. If you have an issue at your company and need to learn how you might improve a process or fix a problem, the Best Manufacturing Practices Center can make resources available to you that will help," said Bruce Coney, director of IPOC.

Those resources include the following:

- The BMP Database software provides a snapshot of systems engineering practices in U.S. industry that have been cited for a variety of industry continuous improvement initiatives such as SAE J4000. This database is continually updated to provide proven solutions to current problems. The solutions are the result of 2,000 best practices that have been documented by impartial engineers and manufacturing experts who conduct extensive surveys of all sizes of companies.
- TRIMS is an on-line tool that measures technical, not cost and schedule, risk management. Cost and schedule overruns are downstream indicators of technical problems. Projects generally have had process problems long before a technical problem is identified.
- KnowHow complements TRIMS by providing on-line how-to books with the rationale and detailed explanations of topics mentioned in TRIMS. KnowHow provides technical reference handbooks, guidelines, and publications.

The main goal of BMP is to increase quality, reliability, and maintainability of goods produced by American firms. Primary steps toward these goals are simple: identify best practices, document them, and then encourage industry, government, and academia to share information about them. By fostering the sharing of information across industry lines, BMP has become a national resource in helping companies identify their weak areas and examine how other companies have improved similar situations. This exchange of best practices allows companies to learn from other companies and avoid costly, time-consuming duplication.

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## Doors to business open with IPOC connection

By Helen K. Randall, HKR Communications

**O**ne way in which the Iowa Procurement Outreach Center (IPOC) has been most beneficial to small businesses over the years has been in helping them make connections with larger businesses. An example in point was the Center's efforts with Job Shops, a Des Moines construction firm.

"Job Shops had made several attempts to work with the U.S. Department of Agriculture, but just hadn't been able to quite get in the door," said Anita Williams, IPOC industry specialist. IPOC was aware that the USDA was contemplating a \$400 million building project in central Iowa. Williams connected Job Shops executives with the right people, in particular Debbie Brock at the Animal Disease Control Center in Ames, to explore a possible bid on the project.

"While there, we discovered a need for construction of laboratories at the Animal Disease Control Center. These would be in the \$1 and \$2 million range," said Williams. "Job Shops gave a synopsis of the company, which is a minority-owned, 8a, certified, local firm."

It was, according to Williams, just the kind of company the Center wanted to handle its project. Although nothing is secured as yet, the paperwork is moving through federal channels.

"IPOC can come in as an advocate for all small businesses in making connections that may lead to business opportunities," Williams said. One source for information about opportunities is the Commerce Business Daily, an on-line newsletter. IPOC staff continually monitor the contents of the newsletter as well as what might best suit the interests of its small business clients.

According to Williams, United Parcel Service has been a successful match for many clients. Although UPS does not have a minority or small business sourcing requirement, it has made strong efforts to link with women- and minority-owned businesses as well as other small businesses. At least four significant contracts came about as a result of an IPOC workshop in 1999, held for the purpose of connecting UPS with smaller firms.

Anita Williams can be reached at 515-294-4475, e-mail: [awilliams@ciras.iastate.edu](mailto:awilliams@ciras.iastate.edu).

## **Best manufacturing processes**

**Continued from page 3**

“Likewise, if your company has a process that you would like to have documented, we can help you certify that process,” said Coney. “You go on record with the national center, and your process is shared in order to help others.” No proprietary information is placed on the database.

For example, BMP documentation developed for lean implementation initiatives is classified under a system known as SAE or Society of Automotive Engineering. SAE J4000 is the identification and measurement marker of best practices in the implementation of lean operations. There are six broad categories containing a total of 52 lean assessment components in SAE J4000.

“These categories break down the process of implementing lean into a manageable set of tasks, so you can approach the effort systematically,” Coney explained. A J4000 user manual, which has its own classification of SAE J4001, is available to assist manufacturers. SAE RR003 contains lean enterprise conversions and best practices examples.

### **Why are IPOC and CIRAS interested in J4000?**

Coney defines lean operation as the continuous shortening of the manufacturing process from receipt of order to receipt of cash. J4000 can assist companies step-by-step with implementation of lean. The system can be used as an assessment tool for a company to evaluate its suppliers and also as a qualifier for doing business via e-commerce.

“We work with small businesses. We find that a lean supplier exhibits the highest quality of product, best delivery, and offers its customers the best competitive advantage,” said Coney.

The lean implementation process can be broken down into the following broad categories:

**Management/trust**—Here, strategic objectives are obtained, policy is formalized, accountability is outlined, and timing is mapped out. Communication becomes key, where details of the lean effort are effectively disseminated at all levels of the organization. Senior managers actively lead and teams deploy. At this stage, a continuous review is necessary, while incentives are being put in place. Policies involving workforce management as a result of the effort are understood and followed.

**People**—Formal training is required, where employees meet on a continuous basis, advancing training standards. Therefore, resources and paid employee training time must be made available. All levels of the organization are trained in tools and measurables suitable to the needs of the organization. Accurate and detailed reports are kept. The structure of the workforce is based on the structure and sequence of the company’s value chain. Employee development is encouraged and supported at all levels under a system of quality circles or continuous improvement teams. Team authority and accountability are stressed. Management support is unwavering.

**Information**—Adequate and accurate operating data is kept and made available without restriction to team members. Knowledge is shared across the entire organization. A financial system is structured to show the results of lean progress, where costing is activity based and mirrors value stream activities, operating income is recognized at the time of shipment, and the focus is on minimizing inventory.

**Supplier/organization/customer**—Here, suppliers and customers participate in the effort at the earliest possible stage, being represented on the product/process/project teams within the company. Both groups participate in regular reviews of progress. A system of incentives is enacted to reward improvements or cost reductions, and long-term agreements are made.

**Product**—Integrated teams conduct product and process design with representation by all internal and external stakeholders as well as suppliers and customers. Cost, performance, and attribute specifications for product and process are clear, measurable, and fully agreed upon. A life-cycle systems approach is used with adherence to DFM/DFA principles and consistent with lean principles. Parameters are set. Provisions are made for constancy of team assignments. Lead times are measured and shortened through continuous improvement processes.

**Process/flow**—Guarantees are made here about the work environment, which will be clean and well organized. Audits will be regular, using the 5S program. A preventive maintenance system is practiced. Bills of material are accurately catalogued. A value stream and regular controls are established, and statistical tools are used to reduce process variability. Results lead to continuous shorter changeover times and smaller lot sizes. Factory layout and employee work methods are considered for efficiencies. Continuous evaluation takes place.

The BMP national center indicates that incremental effort by companies in lean implementation should be allotted in the following manner: 25 percent management/trust, 25 percent people/information, 25 percent suppliers/organizations/customers and product, and 25 percent process flow.

*To learn more about how the best manufacturing practices initiative might benefit your company, contact Coney at (515) 294-4461 or [bconey@ciras.iastate.edu](mailto:bconey@ciras.iastate.edu).*

## CIRAS and Industry Partners

Continued from page 1

The Iowa metalcasting IOF has been active in the first few months of Iowa's IOF effort. John Deere and Progressive Foundry have taken a leadership role in the planning efforts to bring together the fifty-two Iowa foundries. CIRAS and the Metal Casting Center have held awareness seminars throughout the state to bring Iowa's foundries up-to-date on the IOF process. The two documents associated with the national effort, *Beyond 2000: A Vision for the American Metalcasting Industry* and the *Metalcasting Industry Technology Roadmap*, are currently being disseminated to all Iowa foundries.

This spring, Iowa's metalcasting companies will be invited to participate in workshops to develop a metalcasting vision for Iowa. The issues include: human resources, market development, materials and manufacturing technologies, industry profitability, environmental regulations, and energy costs.

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*John Deere and Progressive Foundry have taken a leadership role in the planning efforts to bring together the fifty-two Iowa foundries.*

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Industry will lead the development of a metalcasting roadmap for accomplishing the objectives set out in the metalcasting vision. Iowa universities and USDOE labs will then team up to accelerate the deployment of existing best practices in Iowa and to influence the national metalcasting research and development agendas.

The metalcasting IOF endeavor in Iowa has been modeled after the well-defined national IOF process. Though similar in form, the agriculture plan is broader and potentially more futuristic in its outcome. The national IOF Agriculture work is outlined in the USDOE document, *Plant/Crop-Based Renewable Resources 2020—A Vision to Enhance U.S. Economic Security Through Renewable Plant/Crop-Based Resource Use*. The goal of the agriculture work is to explore avenues of research and industrial development that will derive products or energy from bio-renewable sources, which include crop residues, food processing by-products, or even crops grown specifically for non-food outcomes. Examples of this include the use of corn to produce polymers for various plastics and soybean fractionates for adhesives to be used in plywood.

The first year of the agriculture IOF is being spent in planning—pulling together industry and academia experts and developing initial goals and directions. Several leading-edge companies are assisting, including Cargill Dow LLC, Genencor International, Pioneer Hi-Bred International, and West Central Cooperative. This project may well be a great market-positioning plan for companies that are innovative and seek competitiveness through leadership.

If you would like to become involved in the Industries of the Future initiative in Iowa, contact Ron Cox at (641) 424-5432 or via e-mail at [rcox@iastate.edu](mailto:rcox@iastate.edu).

The U.S. Department of Energy's Office of Industrial Technologies held a Web site contest to promote the new State Industries of the Future initiative. CIRAS was recently notified that their Iowa Industries of the Future Web site took third place in the nationwide contest. The Web site was designed by ISU student Jim Argyros and Iowa IOF Project Manager Ron Cox. The site can be viewed at [www.ciras.iastate.edu/iof](http://www.ciras.iastate.edu/iof).





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## CIRAS CALENDAR

### February 21, 2001

**Quality Systems Consultation: ISU Industry Outreach Center, Cedar Falls.**

Don Brown with CIRAS will be available for free consultation on Quality Systems from 9:00 am –4:00 pm. Don will answer questions and discuss topics such as ISO/QS 9000 or 2000 certification, customer satisfaction assessment and continuous improvement methods. This consultation will be held the third Wednesday of every month. For more information contact Don Brown at 319-398-1272, [dbrown@ciras.iastate.edu](mailto:dbrown@ciras.iastate.edu). or visit the CIRAS Quality Systems Web site at [www.ciras.iastate.edu](http://www.ciras.iastate.edu).

### February 27, 2001

**Installing & Configuring Microsoft Windows 2000 File, Print & Web Servers: ISU Industry Outreach Center, Cedar Falls.**

One-day class from 8:00am-5:00pm. For more information call Nanci Campbell at 319-268-9026. Registration is free to the first 15 registrants from qualified businesses.

### March 1, 2001

**Central Iowa Women/Minority/Small Business Owners Networking Breakfast.**

Downtown Holiday Inn, Des Moines. Cost is \$9.00. Register with Kathy Bryan at 1-800-458-4465 or by e-mail at [kbryan@ciras.iastate.edu](mailto:kbryan@ciras.iastate.edu).

### March 14, 2001

**Introduction to the Theory of Constraints Workshop: ISU Industry Outreach Center, Cedar Falls. 8:30am-5:00pm.**

Tim Sullivan from CIRAS will provide an introduction to the Theory of Constraints (TOC). Registration fee: \$222.00. To register contact Dawn at 319-266-3260. For more information contact Mike Willett at 319-266-3260 or visit the Web site [www.ciras.iastate.edu/toc](http://www.ciras.iastate.edu/toc).

### March 20-21, 2001

**Introduction to Microsoft Project 2000: ISU Industry Outreach Center, Cedar Falls. 8:30am-5:00pm.**

This is a two-day class will provide an introduction to Microsoft Project as a management tool. Cost: \$495.00. For more information call Nanci Campbell at 319-268-9026.

### April 3, 2001

**Cedar Valley Manufacturers Association (CVMA) Expo: Five Sullivan Brothers Convention Center, Waterloo. 10:00am-6:00pm.**

This expo will give your company great exposure if you desire to be an exhibitor. If you are unable to exhibit, you can still be a part of the 2001 Manufacturing Expo by donating prizes or sponsoring some of the different events that are planned. There are many opportunities available! To find out more about donations that are needed, please contact Dawn at 319-266-3260 or visit the Web site at [www.cvma.com/expo2001.html](http://www.cvma.com/expo2001.html)